traditional name (page 212 of his book). 'Tortoiseshell' has been added in one case, to uniformly distinguish all *Nymphalis* species. I feel that any name is good enough, whether common or scientific, if it helps recognition and maintains uniqueness and stability.

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26. STUDIES ON THE INFLUENCE OF TEMPERATURE AND RELATIVE HUMIDITY ON ADULT LONGEVITY, OVIPOSITIONAL PERIOD AND FECUNDITY OF THE RICE MOTH, *CORCYRA CEPHALONICA* (STAINTON) (LEPIDOPTERA: GALLERIIDAE)[1]

Introduction

The rice moth, *Corcyra cephalonica* (Stainton) is a storage pest of oil seeds and cereals with a wide distribution in subtropical and tropical areas. This species is frequently imported into temperate regions with produce such as rice, rice bran, groundnuts and cocoa beans originating from Southeast Asia and West Africa and to a lesser extent from South America (Freeman 1973). The development of *C. cephalonica* on stored products has been studied by several authors. Its life cycle in United States was briefly reported by Chittenden (1919). Krishna Ayyar (1934) described the adult and immature stages and gave an account of its biology and developmental period on different foods under Indian conditions. The rice moth has gained importance in India in recent years mainly on account of its use as laboratory host for rearing many insect natural enemies which are being tried in biological control of crop pests. Reports on the effect of temperature and humidity on the development of *C. cephalonica* are mainly due to the studies made by Sheshagiri Rao (1954), Kamel and Hassanein (1969) and Teotia and Singh (1975). However, there is little information available to date on the development of this insect under controlled conditions on stored sorghum. It is important to know the behaviour of this insect under different combi-

[1]Part of the M.Sc. Thesis submitted by senior author to the University of Agricultural Sciences, Bangalore.

nations of temperature and humidity so that the same can be employed for effective mass multiplication under laboratory condition. An attempt was therefore made to know the effect of temperature and relative humidity on adult longevity, ovipositional period and fecundity of the rice moth at controlled temperature and humidity conditions which are presented in this contribution.

Material and Methods

Constant temperatures of 15°, 20°, 25°, 30°, 35° and 40°C were maintained during B.O.D. incubators. At all these temperatures, relative humidities varying from 30 per cent to 90 per cent (with an increase of 15 per cent) with saturated solutions of salts as per Winston and Bates (1960) were provided. Freshly laid eggs were collected and kept at different temperatures and relative humidities. Insects were reared from egg to adult stage and observations made in respect of adult longevity, ovipositional period and fecundity of the rice moth, at an interval of six hours.

Eggs were incubated at various temperatures and relative humidity conditions in groups of ten in glass tubes (5 × 1.25 cm). Immediately after hatching, larvae were released in plastic containers (5 × 5 cm). Fresh food material was supplemented as and when it was necessary. The culture was maintained on broken sorghum grains (CSH-1) in plastic containers at a temperature of 28°C and relative humidity of 90 per cent. On emergence, the moths were allowed to mate and a pair in copula was collected for further studies on fecundity and longevity. All the studies were made in four replications and the data collected was subjected to logit transformations as suggested by Finney (1952), and statistically analysed using the method of analysis of variance.

Results and Discussion

The results of the present experiment carried out to determine the development of different stages of the pest under various temperature and humidity conditions have been presented in Tables 1-4. The average longevity of adult male and female together varied from 3.11 days at 35°C to 11.94 days at 15°C. The average duration of full life is longest i.e., 120.04 days at 15°C followed by 83.43 days at 20°C, 53.22 days at 25°C, 38.64 days at 30°C and 35.57 days at 35°C (Table 4). The average adult longevity significantly increased with an increase in humidity and decreased with increase in temperatures (Table 1).

There was no development of any stage of the insect at 40°C.

Effect of temperature and relative humidity on fecundity and ovipositional period

The results obtained on oviposition period and fecundity under the set of experimental conditions, as stated earlier have been presented in Tables 2 and 3. The oviposition period was generally higher at higher humidities, for each temperature except at 35°C. It was significantly highest at 15°C and 90 per cent relative humidity (Table 2). So far as the fecundity of the insect is concerned (Table 3), higher values have generally been obtained at temperatures of 15° and 20°C with 90 per cent relative humidity and also at 25° and 30°C with a relative humidity ranging from 75 per cent to 90 per cent, there being no difference in fecundity between these two temperature groups.

Among the temperature and humidity, the former influences the development whereas humidity affects the fecundity.

The present study has indicated very clearly that fecundity is a major factor responsible for rapid build up of population of the insect under any set of temperature and humidity conditions. In the present case, a temperature between 25° and 30°C and relative humidity between 75 per cent and 90 per cent have been particularly found to be very much congenial for the multiplication of the insect.

The average complete life cycle of the insect is completed in 38.64 days at 30°C against 52.22 days at 25°C. This lesser developmental period at 30°C, therefore, suggests that there will be greater population increase at 30°C than at 25°C. At 30°C, population is least affected by humidity since humidity of 75 per cent and above is equally favourable for more egg laying at 30°C and 25°C. Under

TABLE 1

INFLUENCE OF DIFFERENT TEMPERATURES AND RELATIVE HUMIDITY LEVELS AND THEIR INTERACTIONS ON ADULT LONGEVITY OF *Corcyra cephalonica* (STAINTON)

Per cent relative humidity	Temperature (°C)					Average
	15°C (T_1)	20°C (T_2)	25°C (T_3)	30°C (T_4)	35°C (T_5)	
30 (RH_1)	9.50	5.22	4.32	3.16	2.18	4.88
45 (RH_2)	10.48	6.60	4.85	3.71	3.36	5.80
60 (RH_3)	10.65	7.32	5.30	4.25	2.86	6.07
75 (RH_4)	10.77	9.17	5.49	5.17	3.00	6.72
90 (RH_5)	18.32	11.66	6.50	6.33	4.14	9.33
Average	11.94	7.89	5.29	4.52	3.11	

S. Em. (T) ± = 0.04 C.D. at 5% = 0.1139
S. Em. (H) ± = 0.04 C.D. at 5% = 0.1139
S. Em (Int) ± = 0.089 C.D. at 5% = 0.2533

TABLE 2

INFLUENCE OF DIFFERENT TEMPERATURES AND RELATIVE HUMIDITY LEVELS AND THEIR INTERACTIONS ON OVIPOSITION PERIOD OF *Corcyra cephalonica* (STAINTON)

Relative humidity	Temperature (°C)					Average
	15°C (T_1)	20°C (T_2)	25°C (T_3)	30°C (T_4)	35°C (T_5)	
30 (RH_1)	2.323	3.306	2.637	2.450	2.290	2.402
45 (HR_2)	4.000	2.456	3.200	3.273	2.000	2.986
60 (RH_3)	4.190	3.663	3.310	3.000	2.000	3.233
70 (RH_4)	5.603	4.527	4.000	3.000	2.000	3.958
90 (RH_5)	7.300	7.067	5.290	4.860	2.000	5.305
Average	4.684	4.004	4.687	3.449	2.058	

S. Em (H) ± = 0.0230 C.D. at 5% = 0.0657
S. Em (T) ± = 0.0230 C.D. at 5% = 0.0657
S. Em (Int) ± = 0.0516 C.D. at 5% = 0.1468

TABLE 3

INFLUENCE OF DIFFERENT TEMPERATURES AND RELATIVE HUMIDITY LEVELS AND THEIR INTERACTIONS ON FECUNDITY OF *Corcyra cephalonica* (STAINTON)

Relative humidity percentage	Temperature (°C)					Average
	15°C (T_1)	20°C (T_2)	25°C (T_3)	30°C (T_4)	35°C (T_5)	
30 (RH_1)	190.106	217.666	183.333	183.000	157.000	188.288
45 (RH_2)	205.460	241.666	234.887	218.000	162.334	210.469
60 (RH_3)	210.000	226.000	260.667	149.667	171.667	223.000
75 (RH_4)	228.334	226.667	268.000	346.334	164.334	254.733
90 (RH_5)	228.334	338.000	338.334	339.667	322.667	313.413
Average	212.447	256.000	257.057	267.400	195.600	

S. Em (H) ± = 3.514 C.D. at 5% = 10.00

S. Em (T) ± = 3.514 C.D. at 5% = 10.00

S. Em (Int) ± = 7.857 C.D. at 5% = 22.363

TABLE 4

AVERAGE DURATION OF DIFFERENT STAGES AND LIFE CYCLE (IN DAYS) OF *Corcyra cephalonica* (STAINTON) AT DIFFERENT TEMPERATURE

Temperature (°C)	Egg	Larva	Pupa	Adult	Full life period
15	11.227	66.379	30.495	11.947	120.048
20	6.008	56.564	12.862	7.998	83.432
25	4.193	34.744	8.988	4.297	53.222
30	3.046	24.464	6.605	4.526	38.641
35	2.324	24.638	5.502	3.113	35.577

30-45 per cent relative humidity, the number of eggs laid are slightly less when compared with the fecundity at 30°C. But quicker development is observed at 30°C which leads to better population build-up even under low humidity conditions.

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27. LIFE HISTORY OF *CHALCIOPE HYPPASIA* (CRAM.), A BEAN DEFOLIATOR (NOCTUIDAE)

(*With eleven text-figures*)

INTRODUCTION

The yellow semilooper caterpillars of *Chalciope hyppasia* (Cram.) feed on leguminous crops, namely moong, ured, soybean, groundnut, mothbean, lentil, gram, pigeon pea, cowpea and sem. This moth is often extremely abundant on long grasses and is found almost round the year. Beeson (1941) and Pruthi (1969) reported the species as a pest of the forest tree *Sterculia villosa* in north of India. Presently, the insect has assumed the status of a regular pest of sem (*Hyacinth* bean) and cowpea (*Vigna sinensis*) causing defoliation of the respective crops from July to late September in western Uttar Pradesh. Considering the importance of *C. hyppasia* to various legumes, the present study on life history has been carried out.

MATERIALS AND METHODS

A laboratory culture of *C. hyppasia* was maintained on bean leaves from field collected caterpillars during July to September 1985. A regular record of number of eggs laid, larval instars, prepupal and pupal periods, adult longevity and mortality was made. Fifteen caterpillars from each instar preserved in KAAD were used for morphometrics. The average maximum and minimum temperatures and relative humidity were respectively 29.36±0.170, 27.67±0.20°C and 77.77±0.95% during the experiment.

LIFE HISTORY

C. hyppasia (Cram.) completes its life cycle egg to adult in 33.18±0.57 days during July to September under laboratory conditions with an incubation period of 4.38±0.07 days, the neonate caterpillars moulted five times in a duration of 15.30 days to have six instars. The first and sixth instars larvae have an average life of 3 and 4.30±1.18 days respectively whereas the rest of the caterpillars (second to fifth) have a duration of 2 days each. The pupal period has been 6.87±0.33 days and adult longevity has been of similar duration.

EGGS: Eggs are laid singly on leaves in the fields and on muslin cloth in laboratory. A female lays about 61 eggs during her life. Each egg measures 0.628±0.33 mm in diameter, greenish in colour, turns blackish before hatching. It is spherical in shape with smooth texture of the chorion. The micropylar end is slightly depressed and lies glued with the lower surface of the leaf at vegetal end. During July to September the incubation